R18-9-E301. 4.01 General Permit: Sewage Collection Systems

A. A 4.01 General Permit allows a new sewage collection system or an expansion of an existing sewage collection system involving new construction.
   1. A sewer collection system includes all sewer lines and associated structures, devices, and appurtenances that:
      a. Are owned or controlled by a public or private sewer utility extending from the treatment works to the upstream points in the system where private owners assume ownership or control; or
      b. Serve multiple private users from the upstream points where the individual users assume ownership or control to the downstream point where the sewer delivers wastewater to a sewage collection system owned or controlled by a public or private sewer utility, or to a sewage treatment facility.
   2. A sewer collection system repair is not an expansion of the system that requires a Notice of Intent to Discharge. Repairs include work performed in response to deterioration of existing structures, devices, and appurtenances with the intent to maintain or restore the system to its original operational characteristics.

B. Performance. An applicant shall design, construct, and operate a sewage collection system so that it:
   1. Provides adequate wastewater flow capacity for the planned service;
   2. Minimizes sedimentation, blockage, and erosion through maintenance of proper flow velocities throughout the system;
   3. Prevents sanitary sewer overflows through appropriate sizing, capacities, and inflow and infiltration prevention measures throughout the system;
   4. Protects water quality through minimization of exfiltration losses from the system;
   5. Provides for adequate inspection, maintenance, testing, visibility, and accessibility; and
   6. Maintains system structural integrity.

C. Notice of Intent to Discharge. In addition to the Notice of Intent to Discharge requirements specified in R18-9-A301(B), an applicant shall submit the following information:
   1. A statement, signed by the owner or operator of the sewage treatment facility that treats or processes the sewage from the proposed sewer collection system.
      a. The owner or operator shall affirm that the additional volume of wastewater delivered to the facility by the proposed sewer collection system will not cause any flow or effluent quality limits of the individual permit for the facility to be exceeded.
      b. If the facility is classified as a groundwater protection permit facility under A.R.S. § 49-241.01(C), or if no flow or effluent limits are applicable, the owner or operator shall affirm that the design flow of the facility will not be exceeded.
   2. If the proposed sewage collection system delivers wastewater to a downstream sewer collection system under different ownership or control, a statement, signed by the owner or operator of the downstream sewer collection system, affirming that the downstream system can maintain the performance required by subsection (B) if it receives the increased flows associated with the new system or the expansion;
   3. A general site plan showing the boundaries and key aspects of the project;
   4. Construction quality drawings that provide overall details of the site and the engineered works comprising the project including:
      a. Relevant plans and profiles of sewer lines, force mains, manholes, and lift stations with sufficient detail to allow Department verification of design and performance characteristics;
      b. Relevant cross sections showing construction details and elevations of key components of the sewer collection system to allow Department verification of design and performance characteristics, including the slope of each gravity sewer segment stated as a percentage; and
      c. Drainage features and controls, and erosion protection as applicable, for the components of the project.
   5. Documentation of design flows for significant components of the sewage collection system and the basis for calculating the design flows;
   6. An operation and maintenance plan if the project has a design flow of more than 10,000 gallons per day;
   7. Drawings, reports, and other information that are clear, reproducible, and in a size and format specified by the Department. The applicant may submit the drawings in a Department-approved electronic format; and
   8. Design documents, including plans, specifications, drawings, reports, and calculations that are signed and sealed by an Arizona-registered professional engineer unless prohibited by law. The designer shall use good engineering judgement following engineering standards of practice, and rely on appropriate engineering methods, calculations, and guidance.

D. Design requirements.

1. General Provisions. An applicant shall ensure that the design, installation, and testing of a new sewage collection system or an expansion to an existing sewage collection system involving new construction complies with the following rules. An applicant shall:
   a. Base design flows for components of the system on unit flows specified in Table 1, Unit Daily Design Flows. If documented by the applicant, the Department may accept lower unit flow values in the served area due to significant use of low flow fixtures.
   b. Use the "Uniform Standard Specifications for Public Works Construction," referenced in this Section and published by the Maricopa Association of Governments, revisions through 2000, or the "Pima County Wastewater Management," November 1994 Edition, as the applicable design and construction criteria, unless the Department approved alternative design standards or specifications authorized by a delegation agreement under A.R.S. § 49-107.
   c. Use gravity sewer lines, if appropriate. The applicant shall design gravity sewer lines and all other sewer collection system components, including force mains, manholes, lift stations, and appurtenant devices and structures to accommodate maximum sewage flows as determined by the method specified in subsections (D)(1)(c)(i) or (D)(1)(c)(ii) that yields the greatest calculated flow:
      i. Any point in a sewer main when flowing full can accommodate an average flow of 100 gallons per capita per day for all populations upstream from that point, or
      ii. Any point in a sewer collection system can accommodate a peak flow for all populations upstream from that point as tabulated below:

Upstream Population	Peaking Factor
100	3.62
200	3.14
300	2.90
400	2.74
500	2.64
600	2.56
700	2.50
800	2.46
900	2.42
1000	2.38
1001 to 10,000	PF = (6.330 x p -0.231) + 1.094
10,001 to 100,000	PF = (6.177 x p -0.233) + 1.128
More than 100,000	PF = (4.500 x p -0.174) + 0.945

      PF = Peaking Factor

      p = Upstream Population
   d. Ensure the separation of sewage collection system components from drinking water distribution system components under R18-4-502.
   e. Request review and approval of an alternative to a design feature specified in this Section by following the requirements of R18-9-A312(G).
2. Gravity sewer lines. An applicant shall:
   a. Ensure that any sewer line that runs between manholes, if not straight, is of constant horizontal curvature with a radius of curvature not less than 200 feet;
   b. Cover each sewer line with at least three feet of backfill meeting the requirements of subsection (D)(2)(h)(i). The applicant shall:
      i. Include at least one note specifying this requirement in construction plans;
      ii. If site-specific limitations prevent three feet of earth cover, provide the maximum cover attainable, and construct the sewer line of ductile iron pipe or other materials of equivalent or greater tensile and compressive strength;
      iii. If ductile iron pipe is not used, design and construct the sewer line pipe with restrained joints or an equivalent feature; and
      iv. Ensure that the design of the pipe and joints can withstand crushing or shearing from any expected load. Construction plans shall note locations requiring these measures.
   c. If sewer lines cross floodways, place the lines at least two feet below the 100-year storm scour depth and construct the lines using ductile iron pipe or pipe with equivalent tensile strength, compressive strength, shear resistance, and scour protection. The applicant shall ensure that sewer lines

constructed in this manner extend at least 10 feet beyond the boundary of the 100-year storm scouring. Construction plans shall note locations requiring these measures.

d. Ensure that each sewer line is eight inches in diameter or larger except:
   i. The first 400 feet of a dead end sewer line with no potential for extension may be six inches in diameter if the design flow criteria specified in subsection (D)(1)(c) are met. If the line is ever extended, the applicant seeking the extension shall replace the entire length with larger pipe to accommodate the new design flow; or
   ii. The sewer lines for a sewage collection system for a manufactured home, mobile home, or recreational vehicle park are not less than four-inches in diameter for up to 20 units, five-inches in diameter for 21 to 36 units, and six-inches in diameter for 37 to 60 units.

e. Design sewer lines with at least the minimum slope calculated from Manning's Formula using a coefficient of roughness of 0.013 and a sewage velocity of two feet per second when flowing full.
   i. An applicant may request a smaller minimum slope under R18-9-A312(G) if the smaller slope is justified by a quarterly program of inspections, flushings, and cleanings.
   ii. If a smaller minimum slope is requested, the slope shall not be less than 50% of that calculated from Manning's formula using a coefficient of roughness of 0.013 and a sewage velocity of two feet per second.

f. Design sewer lines to avoid a slope that creates a sewage velocity greater than 10 feet per second. The applicant shall construct any sewer line carrying a flow with a normal velocity of greater than 10 feet per second using ductile iron pipe or pipe with equivalent erosion resistance, and structurally reinforce the receiving manhole or sewer main.

g. Design and install sewer lines, connections, and fittings with materials that meet or exceed manufacturer's specifications not inconsistent with this Chapter to:
   i. Limit inflows, infiltration, and exfiltration;
   ii. Resist corrosion in the project electrochemical environment;
   iii. Withstand anticipated live and dead loads; and
   iv. Provide internal erosion protection.

h. Indicate trenching and bedding details applicable for each pipe material and size in the design plans. Sewer lines shall be placed in trenches and bedded following the specifications established in subsections (D)(2)(h)(i) and (D)(2)(h)(ii). This material is incorporated by reference and does not include any later amendments or editions of the incorporated matter. Copies of the incorporated material are available for inspection at the Department of Environmental Quality and the Office of the Secretary of State, or may be obtained from the Maricopa Association of Governments, 302 N. 1st Avenue, Suite 300, Phoenix, Arizona 85003, or from Pima County Wastewater Management, 201 N. Stone Avenue, Tucson, Arizona 85701-1207.
   i. "Trench Excavation, Backfilling, and Compaction" (Section 601), published in the "Uniform Standard Specifications for Public Works Construction," published by the Maricopa Association of Governments, revisions through 2000; and
   ii. "Rigid Pipe Bedding for Sanitary Sewers" (WWM 104), and "Flexible Pipe Bedding for Sanitary Sewers" (WWM 105), published by Pima County Wastewater Management, revised November 1994.

i. Perform a deflection test of the total length of all sewer lines made of flexible materials to ensure that the installation meets or exceeds the manufacturer's recommendations and record the results.

j. Test each segment of the sewer line for leakage using the applicable method below and record the results:
   i. "Standard Test Method for Installation of Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air" published by the American Society for Testing and Materials, (F 1417-92), reapproved 1998;
   ii. "Standard Practice for Testing Concrete Pipe Sewer Lines by Low-Pressure Air Test Method" published by the American Society for Testing and Materials, (C 924-89), reapproved 1997;
   iii. "Standard Test Method for Low-Pressure Air Test of Vitrified Clay Pipe Lines" published by the American Society for Testing and Materials, (C 828-98), approved March 10, 1998; or
   iv. The material listed in subsections (D)(2)(j)(i), (D)(2)(j)(ii), and (D)(2)(j)(iii) is incorporated by reference and does not include any later amendments or editions of the incorporated matter. Copies of the incorporated material are available for inspection at the Department of Environmental Quality and the Office of the Secretary of State, or may be obtained from the

American Society for Testing and Materials, 100 Barr Harbor Drive, Conshohocken, PA 19428-2959.

k. Test the total length of the sewer line for uniform slope by lamp lighting, remote camera or similar method approved by the Department, and record the results.

3. Manholes.

a. An applicant shall install manholes at all grade changes, all size changes, all alignment changes, all sewer intersections, and at any location necessary to comply with the following spacing requirements:

Sewer Pipe Diameter (inches)	Maximum Manhole Spacing (feet)
4 to less than 8	300
8 to less than 18	500
18 to less than 36	600
36 to less than 60	800
60 or greater	1300

b. The Department shall allow greater manhole spacing following the procedure provided in R18-9-A312(G) if documentation is provided showing the operator possesses or has available specialized sewer cleaning equipment suitable for the increased spacing.

c. The applicant shall ensure that manhole design is consistent with "Pre-cast Concrete Sewer Manhole" (#420), "Offset Manhole for 8" - 30" Pipe" (#421), and "Brick Sewer Manhole and Cover Frame Adjustment" (#422), 1998, including revisions through 2000, published by the Maricopa Association of Governments; and "Manholes and Appurtenant Items" (WWM 201 through WWM 211), Standard Details for Public Improvements, 1994 Edition, published by Pima County Wastewater Management.

d. The material specified in subsection (D)(3)(c) is incorporated by reference and does not include any later amendments or editions of the incorporated matter. Copies of the incorporated material are available for inspection at the Department of Environmental Quality and the Office of the Secretary of State, or may be obtained from the Maricopa Association of Governments, 302 N. 1st Avenue, Suite 300, Phoenix, Arizona 85003, or from Pima County Wastewater Management, 201 N. Stone Avenue, Tucson, Arizona 85701-1207.

e. The applicant shall not locate manholes in areas subject to more than incidental runoff from rain falling in the immediate vicinity unless the manhole cover assembly is designed to restrict or eliminate storm water inflow.

f. The applicant shall test manholes using one of the following test protocols:

i. Watertightness testing by filling the manhole with water. The applicant shall ensure that the drop in water level does not exceed 0.001 of total manhole volume in one hour.

ii. Air pressure testing using the "Standard Test Method for Concrete Sewer Manholes by Negative Air Pressure (Vacuum) Test," published by the American Society for Testing and Materials, (C 1244-93), approved August 15, 1993. This material is incorporated by reference, does not include any later amendments or editions of the incorporated matter, and is on file with the Office of the Secretary of State. The material may be viewed at the Department of Environmental Quality, Water Quality Division, or obtained from the American Society for Testing and Materials, 100 Barr Harbor Drive, Conshohocken, PA 19428-2959.

g. The applicant shall perform manhole testing under subsection (D)(3)(f) after installation of the manhole cone to verify watertightness of the manhole from the top of the cone down.

i. Upon satisfactory test results, the applicant shall install the manhole ring and any spacers, complete the joints, and seal the manhole to a watertight condition.

ii. If the manhole cone, spacers, and ring can be installed to final grade without disturbance or adjustment by later construction, the applicant may perform the testing from the top of the manhole ring on down.

h. The applicant shall locate a manhole to provide adequate visibility and vehicular maintenance accessibility after the manhole has been built.

4. Force mains. If it is impractical to install a gravity sewer line system, an applicant may install a force main if it meets the following design, installation, and testing requirements. The applicant shall:

a. Design force mains to maintain a minimum flow velocity of three feet per second and a maximum flow

velocity of seven feet per second.

b. Ensure that force mains have the appropriate valves and controls required to prevent drainback to the lift station. If drainback is necessary during cold weather to prevent freezing, the control system may allow manual or automatic drainback.

c. Incorporate air release valves or other appropriate components in force mains at all high points along the line to eliminate air accumulation. If engineering calculations provided by the applicant demonstrate that air will not accumulate in a given high point under typical flow conditions, the Department shall waive the requirement for an air release valve.

d. Provide thrust blocks or restrained joints if needed to prevent excessive movement of the force main. Construction plans shall show thrust block or restrained joint locations and details. The documentation submitted to the Department for verification of the general permit shall include calculations and analysis of water hammer potential and surge control measures and shall be signed and sealed by an Arizona-registered professional engineer.

e. If a force main is proposed to discharge directly to a sewage treatment facility without entering a flow equalization basin, include in the Notice of Intent to Discharge a statement from the owner or operator of the sewage treatment facility that the design is acceptable.

f. Design a force main to withstand, and upon completion test the force main for leakage, at a pressure of 50 pounds per square inch or more above the design working pressure.

g. Supply flow to a force main using a lift station that meets the requirements of subsection (D)(5).

5. Lift stations. An applicant shall:

a. Secure a lift station to prevent tampering and affix on its exterior, or on the nearest vertical object if the lift station is entirely below grade, at least one warning sign that includes the 24-hour emergency phone number of the owner or operator of the collection system;

b. Protect lift stations from physical damage from a 100-year flood event. Construction of a lift station is prohibited in a floodway;

c. Lift station wet well design. The applicant shall:

i. Ensure that the minimum wet well volume in gallons shall be 1/4 of the product of the minimum pump cycle time, in minutes, and the total pump capacity, in gallons per minute;

ii. Protect the wet well against corrosion to provide at least a 20-year design life;

iii. Ensure that wet well volume does not allow the sewage retention time to exceed 30 minutes unless the sewage is aerated, chemicals are added to prevent or eliminate hydrogen sulfide formation, or adequate ventilation is provided. Notwithstanding these measures, the applicant shall not allow the septic condition of the sewage to adversely affect downstream collection systems or sewage treatment facility performance;

iv. Ensure that excessively high or low levels of sewage in the wet well trigger an audible or visual alarm at the wet well site and at the system control center; and

v. Ensure that a wet well designed to accommodate more than 5000 gallons per day has a horizontal open cross-sectional area of at least 20 square feet.

d. Equip a lift station wet well with at least two pumps. The applicant shall ensure that:

i. The pumps are capable of passing a 2.5-inch sphere or are grinder pumps;

ii. The lift station is capable of operating at design flow with any one pump out of service; and

iii. Piping, valves, and controls are arranged to allow independent operation of each pump.

e. Not use suction pumps if the sewage lift is more than 15 feet. The applicant shall ensure that other types of pumps are self-priming and that pump water brake horsepower is at least 0.00025 times the product of the required discharge, in gallons per minute, and the required total dynamic head, in feet;

f. For safety during operation and maintenance, design lift stations to conform with all applicable state and federal confined space requirements; and

g. For lift stations receiving an average flow of more than 10,000 gallons per day, include a standby power source in the lift station design that may be put into service immediately and remain available for 24 hours per day.

E. Additional Verification of General Permit Conformance requirements. An applicant shall:

1. Supply a signed and sealed Engineer's Certificate of Completion, unless prohibited by law, in a format approved by the Department that provides the following:

a. Confirmation that the project was completed in compliance with the requirements of this Chapter, as described in the plans and specifications corresponding to the Provisional Verification of General

Permit Conformance issued by the Director, or with changes that are reflected in as-built plans submitted with the Engineer's Certificate of Completion;

b. As-built plans, if required, that are properly identified and numbered; and

c. Confirmation of satisfactory test results from deflection, leakage, and uniform slope testing.

2. Provide any other relevant information required by the Department to determine that the facility conforms to the terms of this general permit; and

3. If the project has a design flow of more than 10,000 gallons per day, provide a final operation and maintenance plan that includes the 24-hour emergency number of the owner or operator of the system.

F. Operation and maintenance requirements.

1. The permittee of a sewage collection system that includes a force main and lift station or that has a design flow of more than 10,000 gallons per day shall maintain, and revise as needed, an operation and maintenance plan for the system at the system control center.

2. The permittee shall ensure that the operation and maintenance plan is the basis for operation and continuing maintenance of the sewer collection system.

Historical Note

New Section adopted by final rulemaking at 7 A.A.R. 235, effective January 1, 2001 (Supp. 00-4).